REMARKS

Claims 23-26 and 28-37 were indicated to be directed to allowable subject matter, apart from noted informalities.

Allowable claim 23 has been amended to include base claim 22.

Claims 25-26 have been amended to replace resistance(s) with "component(s) for dissipation of energy". Claims 41-43 recite that the component is a resistance, and a variable resistance. No new matter is entered by way of these amendments.

Device claims 38-40 are cancelled without prejudice.

The remaining claims have been amended to remedy the stated basis of objection. Withdrawal of the claim objection is solicited.

Having amended the claims to remedy the stated basis of objection, each of the dependent claims is believed allowable.

Allowance of claim 23 and its dependent claims is solicited.

This response is believed to be fully responsive and to put the case in condition for allowance. Entry of the amendment; and a timely Notice of Allowance be issued in this case.

Should there be any matters that need to be resolved in the present application; the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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LISTING OF CLAIMS:

1-22. (cancelled)

23. (as amended) Process for the balanced charging of a lithium ion or lithium polymer battery comprised of a series of n different cells (1), with n > 2, each cell being comprised of elements mounted in parallel, said process comprising the steps of:

continuously providing, from an onset of a charging operation of the battery (2) and throughout the charging operation, a surveillance of levels of charge of the different cells (1);

carrying out, as a function of the surveillance of said charge levels, one of i) a uniform supply of all the cells (1), and ii) a balancing of said charge levels of said cells (1) by supplying said cells in a differentiated manner as a function of said cell's current levels of charge;

triggering for each cell (1) of the battery, one cell after another cell in a sequential manner, for a fractional portion of the total charge time of the battery (2), sequences comprising a refreshed evaluation of the level of the charge of the cell (1) in question, followed, as a function of the cell's level of charge and with respect to all the levels of charge of the other cells (1) of the battery, a uniform or differentiated supply, according to a repeating cycle throughout the charging operation; and

executing, from the beginning of the charging operation, the following operations under the management of a digital processing unit (3):

- A) evaluation of the quantity of energy stored in each cell (1) by measuring a parameter indicative of said quantity;

- B) comparative analysis of the different evaluated quantities of energy or of the different values of the measured parameter for each cell (1);

- C) determination of the cell (1) tardiest to charge and of the cell or cells (1) the most advanced in charging; and

- D) supplying the different cells (1) in one of i) a uniform manner and ii) with the limitation of charging current for the cells (1) other than the tardiest or for the cell or cells most advanced in charging, by derivation of all or a portion of said current at a limited level;

- with a sequential repetition of the operations A), B), C), and D) obtaining one of i) an end condition of charge of the battery (2) and ii) a detection of a fault, of a dysfunction or an exceeding of an admissible threshold value.

24. (as amended) Process according to claim 23, wherein the measured parameter in each respective cell (1) utilized for evaluation of the quantity of energy stored in each respective cell is the voltage at the terminals of the respective cell (1).

25. (as amended) Process according to claim 23, wherein derivation of current in the cell or cells most advanced in charging is carried out by derivation circuits (4) each associated by mounting in parallel with one of said cells (1), said circuits (4) each integrating a switching member (5) and at least one component for dissipation of energy (6).

26. (as amended) Process according to claim 24, wherein charging with sequential balancing comprises the following further operations:

a) scrutinizing one by one all the cells (1) of the battery (2) by measuring the voltages at the cell terminals, the voltage measurement being without the resistances (6) of derivation or balancing being connected;

b) detecting the cell (1) tardiest to charge;

c) detecting the cells (1) which, relative to the least charged or tardiest cell (1), have an overcharge greater than a predetermined threshold value of difference of capacity;

d) individually connecting each cell (1) detected to have a surcharge greater than a threshold value, to a corresponding balancing resistance (6) so as to produce a decrease of the charging current for each of the cells (1) in question during a predetermined sequential duration;

e) disconnecting the balancing resistances (6) of all the cells (1) after lapse of the predetermined sequential duration; and

f) carrying out again steps a) to e) after the elapse of a stabilization delay of the voltages of the cells (1).

27. (as amended) Process according to claim 23, wherein the charging of the battery (2) is normally stopped when the current intensity of the overall charge of the assembly of cells (1) descends below a predetermined threshold value.

28. (as amended) Process according to claim 25, wherein the voltage at the terminals of each cell (1) is measured by an assembly (7) of corresponding measurement modules (7'), whose output signals are transmitted to the digital processing unit (3), the digital processing unit controlling, in the following cycle, the switching members (5) of the different derivation circuits (4) as a function of the comparative development of said output signals provided by the modules (7').

29. (as amended) Process according to claim 23, wherein,

the operations are repeated, during all the charging operation, as a cyclic loop formed by two operational half cycles, carried out successively at each cycle loop, i) a first half cycle comprising the consecutive execution of successive

reading of the voltages of the different cells (1) and triggering, offset in time, the balancing resistance (6) for each cell (1) whose voltage difference (dV) with the tardiest cell of the preceding cycle is greater than a threshold value (dVs), and ii) a second half cycle comprising the following operations: successive disconnection of the balancing resistances (6) of the different cells (1) and waiting for the stabilization of the voltages of the different cells (1) before their reading during the first half cycle of the following cycle, the two half cycles.

30. (as amended) Process according to claim 29, wherein the threshold value of voltage difference (dVs) comprises in a first predetermined fixed value (V1) when the voltage difference (dV) between the voltage of the cell (1) having the highest voltage and the voltage of the cell (1) having the least voltage is less than a second predetermined fixed value (V2), greater than the first predetermined threshold value (V1).

31. (as amended) Process according to claim 30, wherein, when the voltage difference (dV) between the voltage of the cell (1) having the highest voltage and the voltage of the cell (1) having the lowest voltage is greater than a second predetermined fixed value (V2) the threshold value of voltage difference (dVs) consists of a third predetermined fixed value (V3) less than said second value (V2).

32. (as amended) Process according to claim 31, wherein the third predetermined fixed value (V3) is greater than said first predetermined fixed value (V1).

33. (as amended) Process according to claim 29, wherein the threshold value of the difference of voltage (dVs) corresponds to a given fraction of the voltage difference (dV), measured during the preceding cycle between the voltage of the cell (1) having the highest voltage and the voltage of the cell (1) having the lowest voltage, when during the cycle taking place, said voltage difference (dV) is still higher than a fourth predetermined fixed value (V4).

34. (as amended) Process according to claim 29, wherein the measurements of the voltages of the different cells (1) are carried out only after the elapse of a give delay following the suppression of the current derivations, so as to permit stabilization of the voltages at the terminals of said cells (1).

35. (as amended) Process according to claim 26, wherein the powers of the different derivation circuits (4) are selected to be near the values provided by the formula:

$$Psd\ max = \frac{V\ max\ cell * \% * AH}{Tc}$$

in which:

Psd max = maximum power optimized to dissipate, expressed in watts;

Vmax cell = maximum voltage measured during charging at the terminals of a cell, expressed in volts;

% = ratio expressed in percentage, corresponding to the maximum difference between two cells to compensate during charging;

AH = nominal capacitance of the battery expressed in Ah (Ampere-hours);

Tc = battery charge time expressed in hours.

36. (as amended) Process according to claim 23, further comprising, at the outset of the charging operation, before triggering the execution of the operations A), B), C), and D), in measuring the standby voltage (Vo) of a charger (8) connected to the battery (2), and stopping said charging operation upon a triggering of a corresponding arm or display of a message, when said standby voltage (Vo) is greater than a maximum admissible voltage (Vmax) for each cell (1).

37. (as amended) Process according to claim 29, further comprising, before the execution of a following loop, a step of verifying whether at least one of the cells (1) of the battery (2) has at the cell's terminals a voltage higher than the maximum

admissible voltage (Vmax) and thereupon in interrupting the charging operation.

38-40. (cancelled).